

CLAIMS:

1. A nonaqueous electrolyte characterized by containing:
an ionic liquid having general formula (1) below and a
5 melting point not higher than 50°C



wherein R¹ to R⁴ are each independently an alkyl group of 1 to 5 carbons or an alkoxyalkyl group of the formula R'-O-(CH₂)_n- (R' being methyl or ethyl, and the letter n
10 being an integer from 1 to 4), and any two from among R¹, R², R³ and R⁴ may together form a ring, with the proviso that at least one of R¹ to R⁴ is an alkoxyalkyl group of the above formula,

X is a nitrogen atom or a phosphorus atom, and

15 Y is a monovalent anion;

a compound which reductively decomposes at a more noble potential than the ionic liquid; and
a lithium salt.

- 20 2. The nonaqueous electrolyte of claim 1 which is characterized in that the compound reductively decomposes at a more noble potential than the ionic liquid when a working electrode used with the electrolyte is made of a carbonaceous material or metallic lithium.

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3. The nonaqueous electrolyte of claim 1 or 2 which is characterized in that the content of said compound within the electrolyte is from 0.1 to 60 wt%.

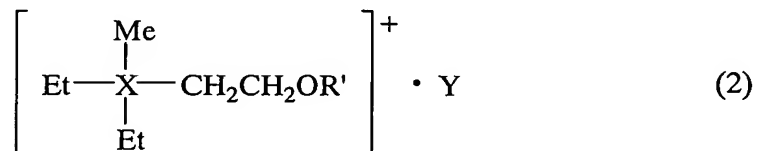
- 30 4. The nonaqueous electrolyte of claim 3 which is characterized in that the content of said compound is 0.1 to 30 wt%.

5. The nonaqueous electrolyte of any one of claims 1 to 4 which is characterized in that the compound is one or more selected from among ethylene carbonate, propylene carbonate, vinylene carbonate, dimethyl carbonate, ethyl methyl carbonate and diethyl carbonate.

6. The nonaqueous electrolyte of any one of claims 1 to 5 which is characterized in that the ionic liquid has a melting point not higher than 25°C.

7. The nonaqueous electrolyte of any one of claims 1 to 6 which is characterized in that X is a nitrogen atom, R' is methyl, and the letter n is 2.

8. The nonaqueous electrolyte of any one of claims 1 to 6 which is characterized in that the ionic liquid has general formula (2) below



wherein R' is methyl or ethyl, X is a nitrogen atom or a phosphorus atom, Y is a monovalent anion, Me stands for methyl and Et stands for ethyl.

9. The nonaqueous electrolyte of any one of claims 1 to 8 which is characterized in that Y is BF_4^- , PF_6^- , $(\text{CF}_3\text{SO}_2)_2\text{N}^-$, CF_3SO_3^- or CF_3CO_2^- .

10. The nonaqueous electrolyte of any one of claims 1 to 9 which is characterized in that the lithium salt is LiBF_4 , LiPF_6 , $\text{Li}(\text{CF}_3\text{SO}_2)_2\text{N}$, LiCF_3SO_3 or LiCF_3CO_2 .

11. A nonaqueous electrolyte secondary cell having a positive electrode which contains a lithium-containing double oxide, a negative electrode which contains a carbonaceous material capable of inserting and extracting lithium ions or
5 contains metallic lithium, a separator between the positive and negative electrodes, and a nonaqueous electrolyte;

which secondary cell is characterized in that the nonaqueous electrolyte is a nonaqueous electrolyte according to any one of claims 1 to 10.

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12. The nonaqueous electrolyte secondary cell of claim 11 which is characterized in that the separator is a porous film or porous sheet having a thickness of 20 to 50 μm and a porosity of 25 to 85%.

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13. The nonaqueous electrolyte secondary cell of claim 12 which is characterized in that the porous film or porous sheet is composed primarily of cellulose.